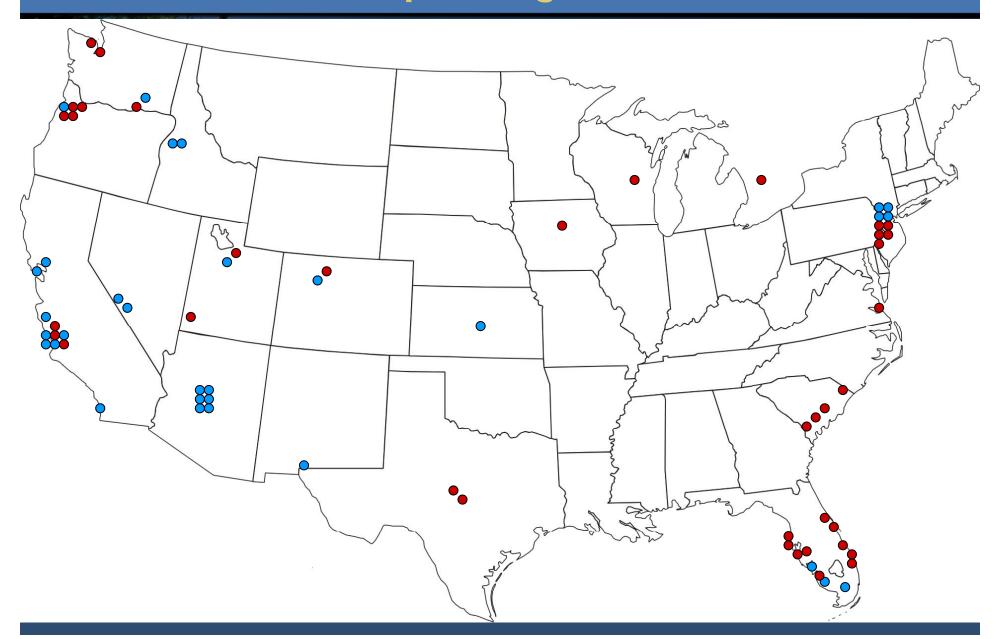


Status of Aquifer Storage and Recovery in the Northern Everglades

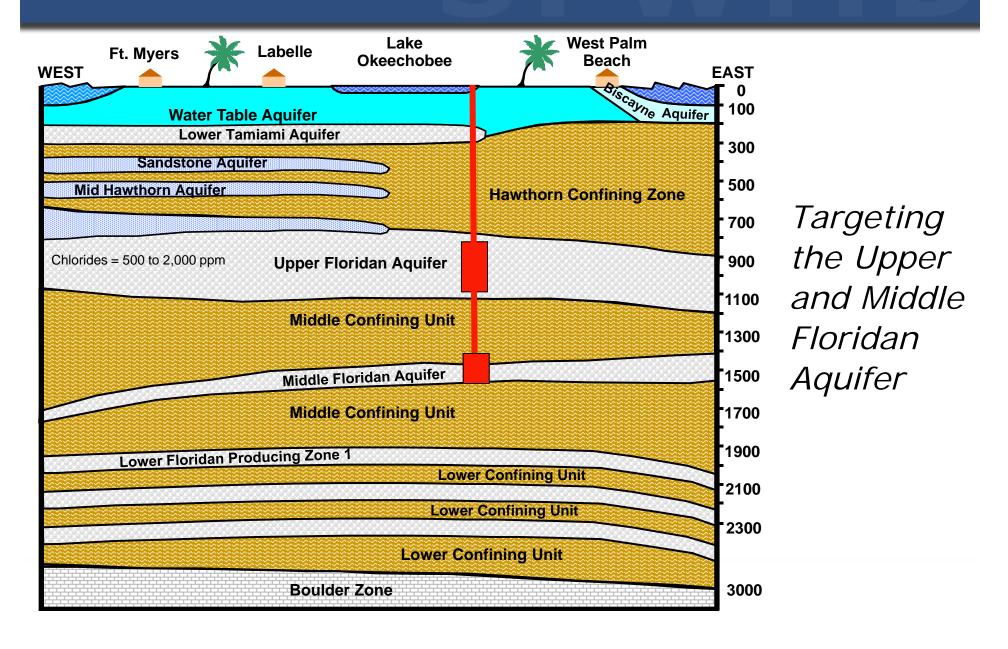
Northern Everglades Interagency Team Meeting July 23, 2010

Bob Verrastro, Lead Hydrologist, Policy and Coordination Department, SFWMD

78 ASR wellfields operating in the U.S. as of 2008



Hydrogeology of South Florida ASR



Two CERP pilots have been constructed







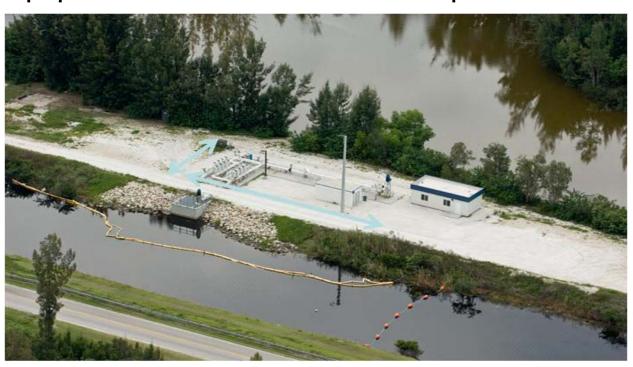
Hillsboro ASR Pilot Project



- Began cycle testing in January 2010
- Simple design
- ASR wells will be integrated into Site 1 Impoundment
- High-capacity well (8 mgd) will need fewer wells here than planned

Hillsboro ASR Pilot

- Fit within a canal right-of-way
- Surface footprint of about 1/2 acre
- In 90 days, this system will store 1,350 ac/ft
- Mechanical filtration coupled with UV
- One pump pushes water into the aquifer at 80 psi



Kissimmee River ASR Pilot Project



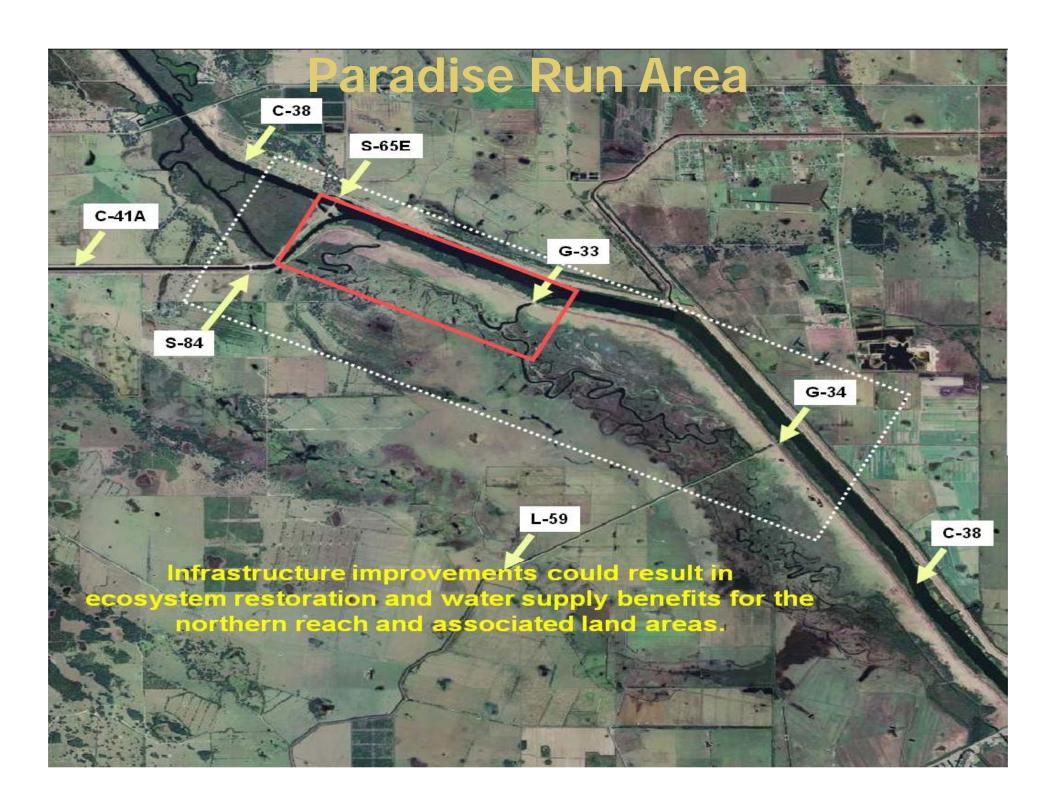


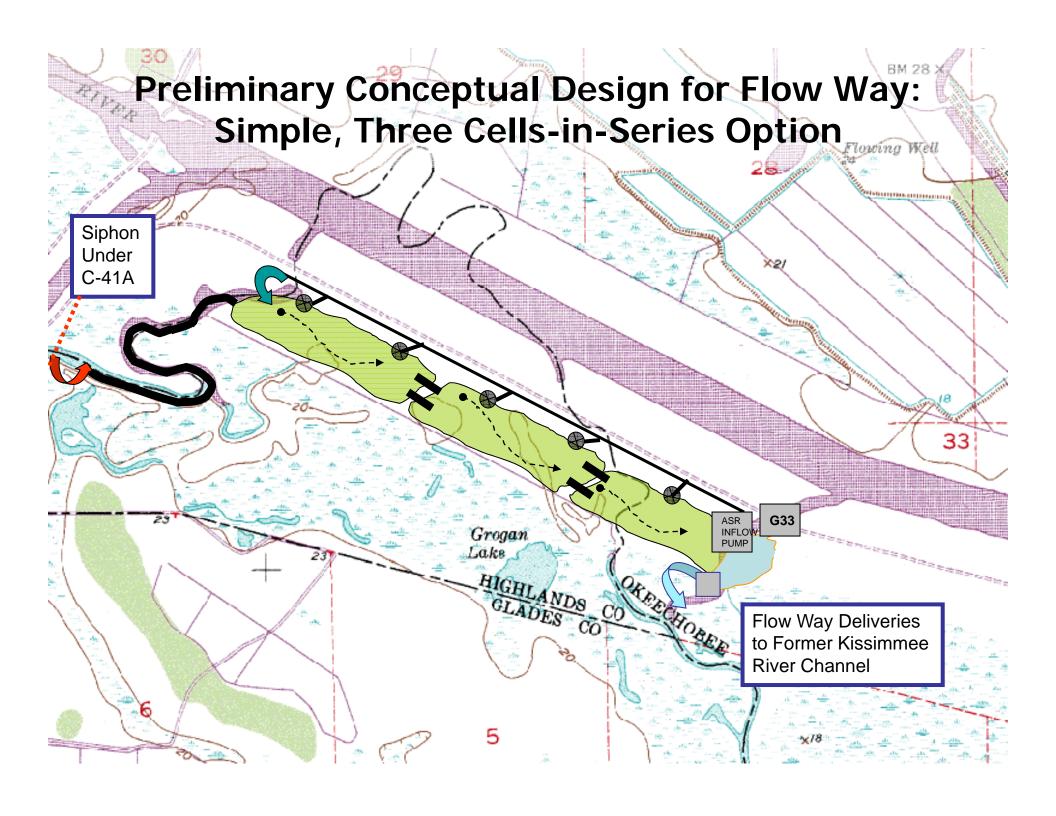


Kissimmee River ASR Pilot Project

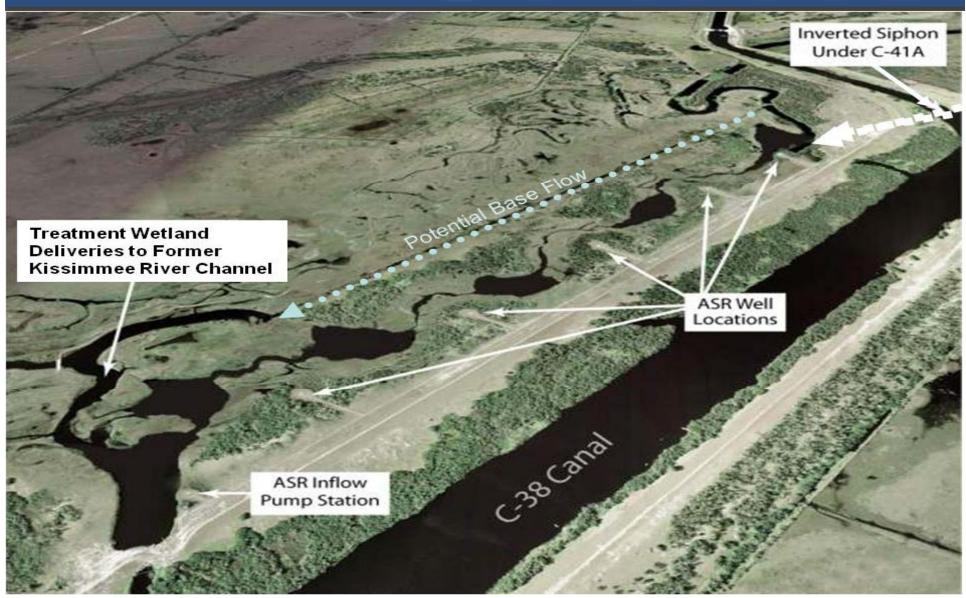


- Recovery efficiency near 100%
- No toxicity or bioaccumulation
- Some arsenic during first cycle, but diminished during cycle #2.
- Apparent nutrient (P) reduction from >100 to <20</p>
- Now into cycle #3
- Ultraviolet disinfection (UV) effectiveness is impacted by canal water variability (\$\$\$)
- Periodic well rehabilitation may be required





50-mgd ASR Demonstration System Conceptual Design





SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Seminole Tribe Brighton Reservation ASR Pilot Project

- Siting Evaluation
- Exploratory Well
- Permitting initiated
- Conceptual design
- Geotech evaluation for passive treatment
- Project not to be funded in FY2011





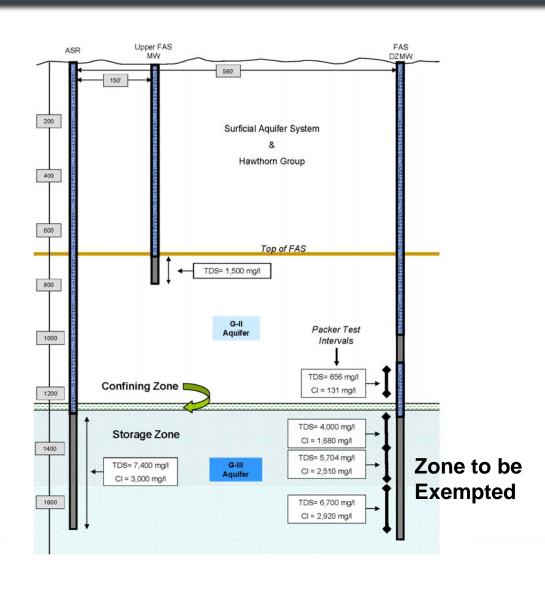


Taylor Creek/Nubbin Slough ASR Demonstration Project



- Constructed by SFWMD in 1989
- Store Water in the "middle" Floridan Aquifer
- Evaluate Phosphorous Removal via ASR Storage
- Evaluate Coliform Die-Off Phenomenon
- Highly Transmissive Interval
- Aquifer Exemption Issued to Facilitate Testing

Aquifer Exemption to test the need for Disinfection



ASR Design

- Driven by the surface (source) water quality and the characteristics of the aquifer
- Surface facilities include basic filtration, disinfection, and aeration.
- Capital cost (per well) for 5 mgd pilots \$4M to \$6M
- Wells can be grouped in clusters of 10 to centralize pumping and treatment systems – 50 mgd (80 cfs)
- Requires no land acquisition systems can "fit" into existing footprints and right-of-ways

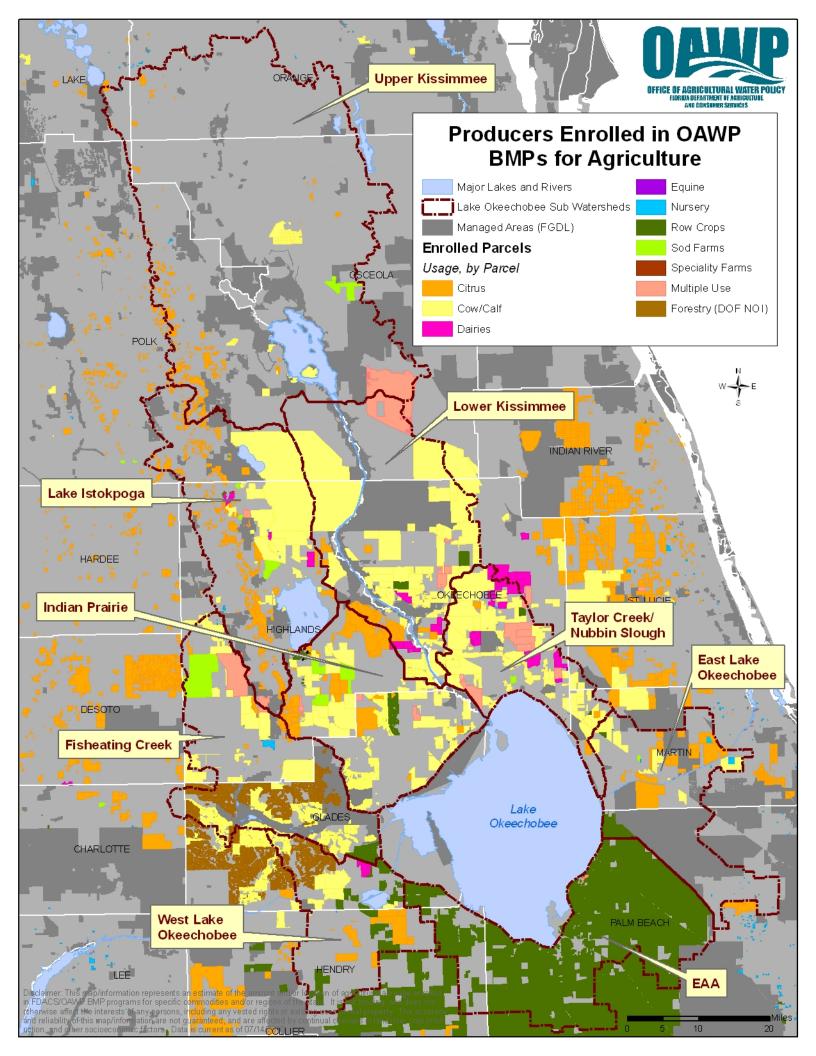
Issues and Uncertainties

- Permitting- Several different types of permits as well as coordination and time required
- Hydrogeology is variable, so a phased approach is prudent
- Arsenic mobilization is potential, but typically temporal
- Well clogging and source water variability result in higher treatment and maintenance costs
- Monitoring costs are initially high, but decline over time

Questions?

Operations & Maintenance Costs

- Daily pumping electrical cost = \$200 \$300 for the 5 mgd pilot systems
- Monitoring, maintenance and compliance costs add about \$500/day per well, but that decreases over time
- During periods of storage and recovery, costs drop significantly





2011 Lake Okeechobee Protection Plan Update

5.2.4 Development of Sub-watershed Conceptual Plans

5.6.2 CERP Lake Okeechobee Watershed Project

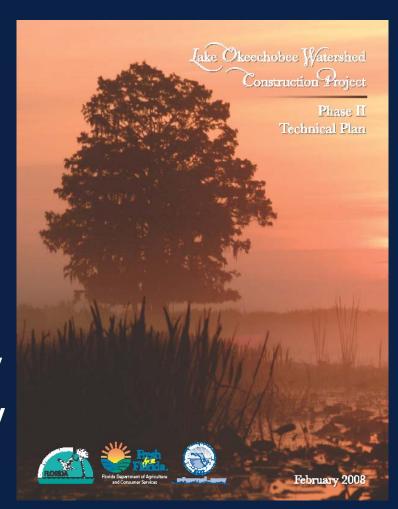
Armando Ramirez
Project Coordination Division

sfwmd.gov



4 Development of Sub-watershed Conceptual Plans

- Lake Okeechobee Phase II Technical Plan
 - Delivered to Legislature-Feb 2008
 - Conceptual Plan- storage and water quality targets for nine subwatersheds
 - Detailed studies- still needed for each sub-watershed to better refine targets and strategies
 - Fisheating Creek Feasibility Study
 - Taylor Creek Site Feasibility Study

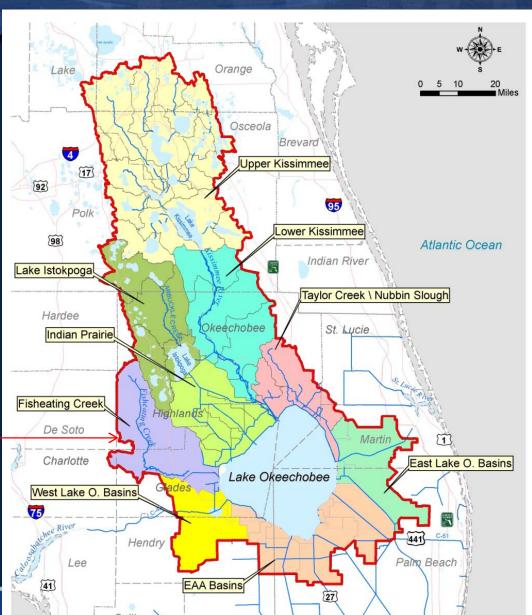




sfwmd.gov

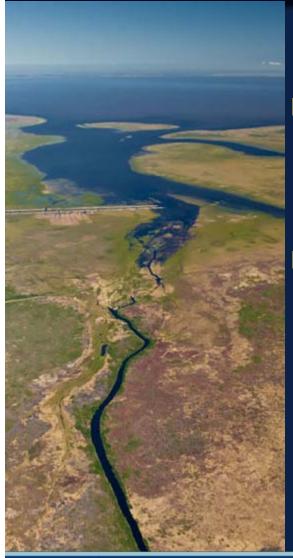
Fisheating Creek Feasibility Study







Fisheating Creek Feasibility Study



- Fisheating Creek- selected due to challenges associated with this portion of the Watershed
- Objective: To identify the best mix of storage and water quality features to improve the hydrology and water quality within the subwatershed.



Fisheating Creek Feasibility Study Phases



- Conducted in two phases with large stakeholder involvement
 - Phase I Data assimilation completed in March 2009
 - Phase II- Plan formulation, evaluation and selection; currently underway



Fisheating Creek Feasibility Study Phase II Completed Activities



- Developed and implemented strategies for identifying realistic targets based on an analysis of output from WAM simulations of pre-drainage and existing conditions
- Planning targets for achieving storage and water quality improvements (P-load reduction) have been identified
- Conceptual project features that will address objectives have been short listed



Fisheating Creek Feasibility Study Phase II Next Steps



- Tentatively locate project features
- Combine project features into alternative plans
- Evaluation and comparison of the performance and benefits of the various alternative plans
- Selection of the preferred plan
- Fisheating Creek Feasibility Report



Fisheating Creek Feasibility Study-Next Steps and Schedule

Finalize FS Targets

Ţ

Identify Solutions (Project Features)



Combine project features into Alternative Plans



Evaluate and compare Alternative Plans



Select Preferred Plan



Document Preferred Plan(Feasibility Study Report)

Summer 2010

Summer 2010

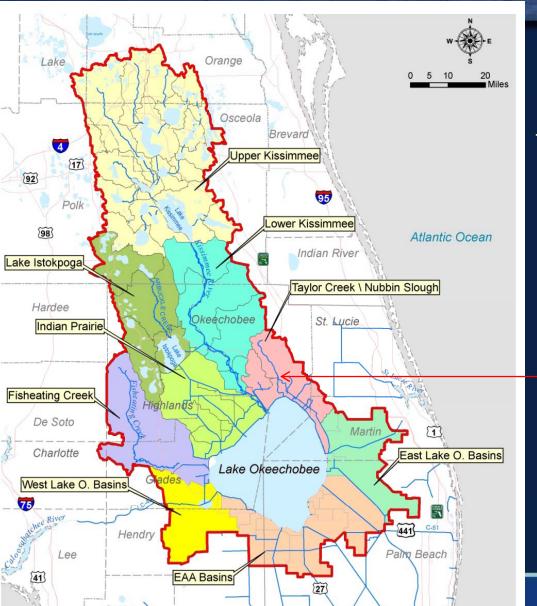
Fall 2010

Winter 2010

Spring 2011

Fall 2011

Lake Okeechobee Watershed



Taylor Creek Site Feasibility Study

sfwmd.gov



Taylor Creek Site Feasibility Study



Objective: Evaluate alternatives and develop a preferred plan for water quality and storage options for the Taylor Creek/Grassy Island property



Taylor Creek Site Feasibility Study Phases



Conducted in two phases

- Phase I Evaluation of existing information- underway
- Phase II- Plan formulation, evaluation and selection of a preferred plan



5.6.2 CERP Lake Okeechobee Watershed Project

The primary objectives:



➤ To increase aquatic and wildlife habitat in Lake
Okeechobee by providing the capability to better
manage water levels in the lake



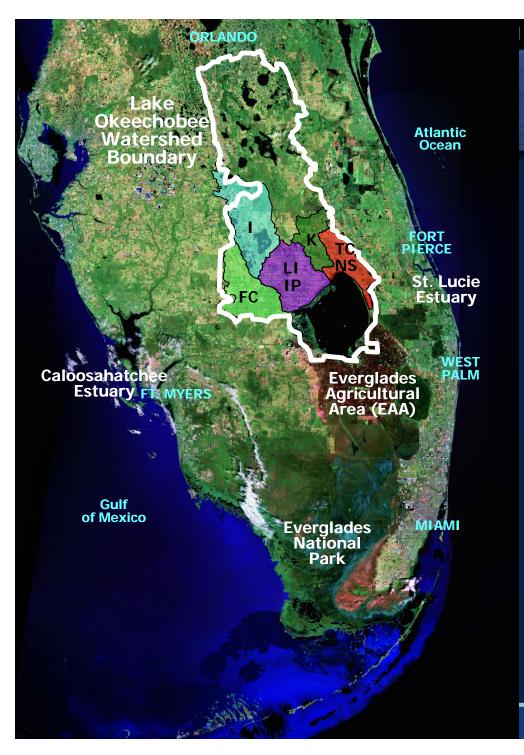
Reduce nutrient loading into Lake Okeechobee



Restoring hydrology and ecological function of impacted wetlands in the study area



Improve the ecological health and aquatic an wildlife habitat of Lake Istokpoga through modifications



ANAGEMENT DISTRICT

CERP LOW Project Planning Areas

- Kissimmee River (K)
- Istokpoga (I)
- Lake Istokpoga/Indian Prairie (LI/IP)
- Fisheating Creek (FC)
- Taylor Creek/Nubbin Slough (TC/NS)

Lake Okeechobee Watershed:

- Approximately 5.5 million acres
- Historically dominated by wetlands (~580,000 acres)
- Current land use
 - Natural areas (37%)
 - Improved and unimproved pasture (24%)



CERP LOW Planning Objectives and Quantified Goals

Improving Quality, Quantity, Timing and Distribution of Water in the Lake Okeechobee Watershed

Capture and detain stormwater runoff in the watershed

Quantified goal: maximize contribution towards overall Lake storage goal of 900,000 to 1.3 million acre-feet

 Reduce nutrient loading to the lake by treating nutrient-contaminated stormwater runoff

Quantified goal: maximize contribution towards the overall Lake P-load reduction goal

Restore isolated wetlands in the watershed

Quantified goal: maximize contribution towards the overall wetland restoration required in the watershed

 Provide more natural water level fluctuations to enhance habitat quality by improving existing, restrictive Lake Istokpoga regulation schedule



ANAGEMENT DISTRICT

CERP LOW Project Study Area

- Kissimmee River (K)
- Istokpoga (I)
- Lake Istokpoga/Indian Prairie (LI/IP)
- Fisheating Creek (FC)
- Taylor Creek/Nubbin Slough (TC/NS)
 - 1,800 miles² (1.2 million acres)
 - Subset of the lake's entire watershed
 - No overlap with Kissimmee River Restoration Project
 - Divided into 5 Planning Areas based on drainage basins
 - Runoff and P-load from all planning areas contribute to problems in the lake



CERP LOW Problems & Opportunities

- Undesirable stages in Lake Okeechobee
- Large and untimely freshwater releases to the estuaries

Project: capture and store watershed stormwater runoff in above ground - Reservoirs

Poor water quality in Lake Okeechobee

Project: treat captured nutrient-loaded stormwater runoff prior to discharge to the lake – STAs

Wetlands loss in the watershed

Project: Restore wetlands

Lake Istokpoga ecology impacted due to restrictive regulation schedule

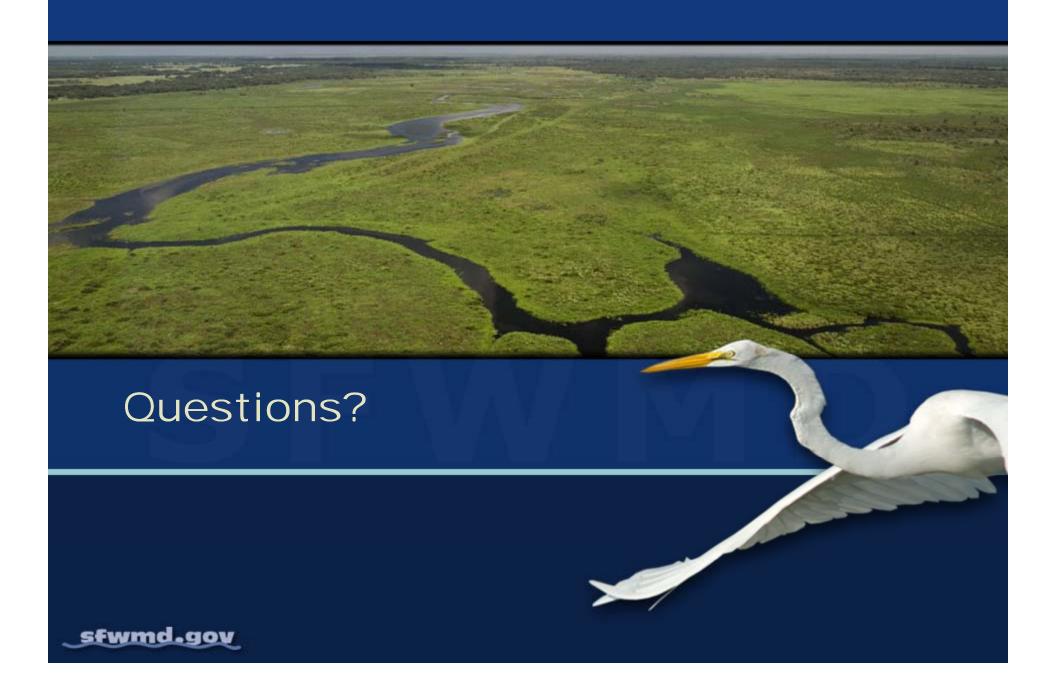
Project: Implement less restrictive, ecologically-friendly regulation schedule





- 1. Istokpoga Regulation Schedule
- 2. Paradise Run Wetland Restoration
 - 3,730 acres
- 3. Water Storage & Treatment
 - K42 Reservoir 161,263 ac-ft
 (Size=10,281 ac ~ Depth=16')
 - I-17 Reservoir 79,560 ac-ft (Size=5,416 ac ~ Depth=16')
 - T-26 Reservoir 32,000 ac-ft (Size=1,984 ~ Depth=18')
 - T-01 STA 3,975 acres (~16 metric tons of P removal)
 - I-01 STA 8,044 acres (~30 metric tons of P removal)
- 4. Recreational Features

SOUTH FLORIDA WATER MANAGEMENT DISTRICT







Kissimmee Watershed Program

- Kissimmee River Restoration Project
 - Kissimmee River Construction
 - Kissimmee Headwaters Revitalization Project
 - Kissimmee River Restoration Evaluation Program
 - Kissimmee Basin Modeling and Operations Study
- Kissimmee Chain of Lakes Long-Term Management Plan



Restoration Goals

- Reestablish ecological integrity to one-third of river and floodplain (39 mi²)
 - Reconstruct river's physical form
 - Reestablish historical stage and discharge characteristics
- Return flow to 40 miles of reconnected river channel
- Reestablish 20 mi² of new wetlands
- Increase quantity and quality of shoreline habitat in headwater lakes
- Maintain existing levels of flood control



Responsibilities and Costs



- 50/50 cost-share agreement between USACE and SFWMD
 - USACE: engineering and construction
 - SFWMD: land acquisition and evaluation
- Total cost: \$634 million
 - SFWMD expended \$341 million to acquire approximately 102,061 acres

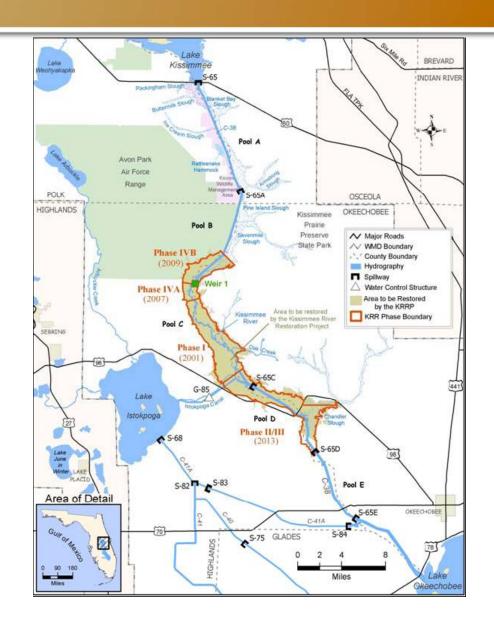


Restoration Components

- Acquire 65,603 acres in Lower Kissimmee subwatershed
- Backfill 22 miles of C-38 canal
- Reconnect original river channel across sections of backfilled channel
- Re-carve sections of river channel destroyed during canal construction
- Remove S-65B, S-65C and tieback levees
- Modify operations at C-38 structures



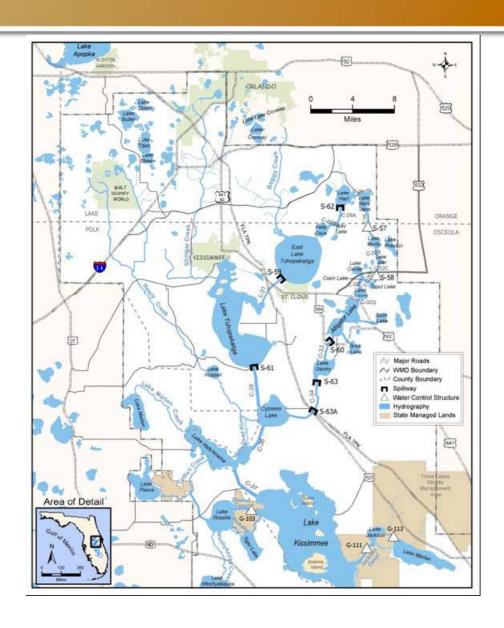
Restoration Area







Kissimmee Chain of Lakes





Preliminary Indications of Restoration Success

- Sandbars and sandy bottom in river bed and formerly isolated sections of river
- Reappearance of emergent and shoreline vegetation
- Establishment of river's former physical form with its historical water levels and flows
- Increase in dissolved oxygen concentrations to expected levels in the river channel
- Reduction in accumulated river sediment
- Increased populations of bass and sunfish
- More use of river and floodplain by birds
 - Waterfowl have returned to floodplain
 - Wading bird densities exceed expectation



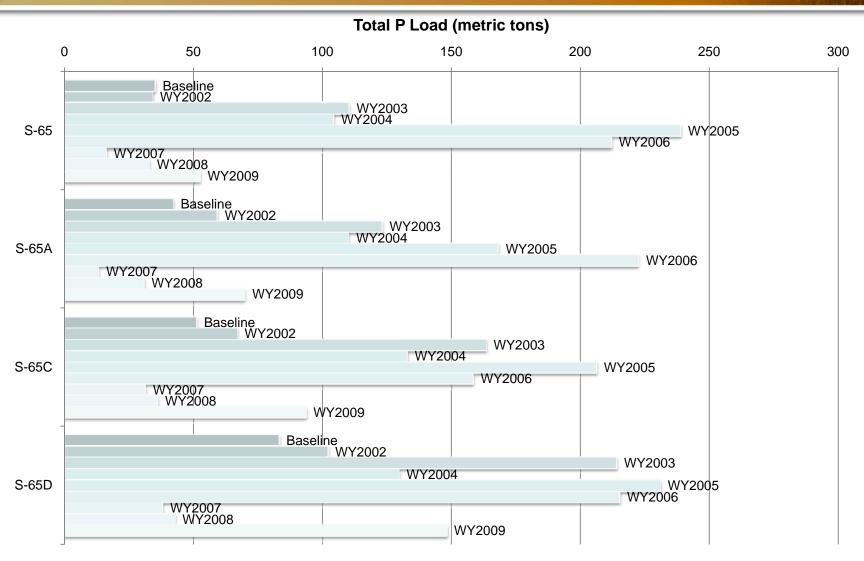
Kissimmee River Phosphorus Study

- Lake Okeechobee TMDL cannot be attained without substantially reducing P loading from Kissimmee River
 - Kissimmee River contributes > 30% of P load to Lake Okeechobee
 - River's average annual contribution over last eight years exceeds Lake Okeechobee TMDL of 140 mt/yr
- Estimating how much river restoration may contribute to P reduction efforts will help determine if TMDL can be met

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



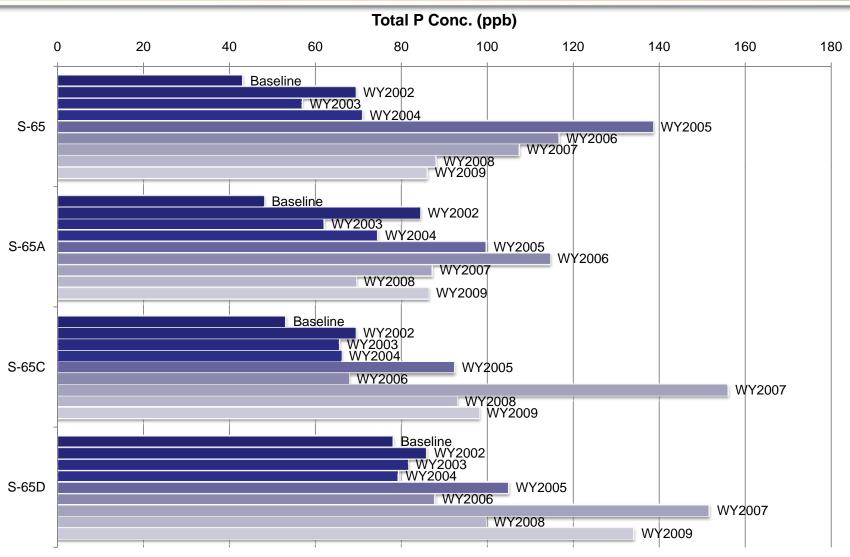
P Loads from C-38 Structures







P Concentrations at C-38 Structures







Phosphorus Study

- Work planned for FY2011:
 - Expanded water quality monitoring
 - Sampling of P concentrations in river channel sediment and floodplain soil
 - P budget for the riverfloodplain system
 - Examination of links between P dynamics and geomorphic studies and hydrologic modeling





Kissimmee Basin Modeling and Operations Study

- Identify alternative operating criteria for 13 structures controlling flow through KCOL and Kissimmee River
- Define structure operations needed to meet hydrologic requirements of river restoration project, while achieving more acceptable balance between flood control, water supply, aquatic plant management, and KCOL objectives
- Ensure that modified operations will not impact desired stage envelope for Lake Okeechobee
- Operating criteria will be developed with complete reliance on existing water management infrastructure and land interests of State of Florida and SFWMD
- Final deliverable will be modified interim and long-term operating criteria for Kissimmee Basin water control structures



Kissimmee Chain of Lakes

- Long-Term Management Plan
 - Purpose: Enhance and/or sustain lake ecosystem health through a coordinated multi-agency, multidisciplinary management framework
 - Defines management objectives and assessment targets
 - Identifies watershed and lake management tools to address issues and concerns
 - Proposes monitoring and assessment program to support adaptive management process



Kissimmee Chain of Lakes

- Agency partners and stakeholders include:
 - SFWMD, FWC, FDEP, FDACS, USACE, USFWS, USEPA, local governments, community leaders, Lake Mary Jane Alliance, Audubon of Florida, The Nature Conservancy, Alligator Chain of Lakes Home Owners Association, Alligator Chain Heritage Association
- Monitoring and assessment program expected to begin in late 2010



Other Activities Lake Point Project

SFWMD

- Long-term project to construct storage lakes and treatment area
- Agreement between the District and Lake Pointconduct mining operations, construct storage lakes and treatment areas
- Total area 2,241 acres located in Port Mayaca on south side of Kanner Highway and C-44 canal
- Project life is not to exceed 25 years



LOPP Update Schedule



- NE Interagency Meeting LOPP Update 08/10
- Lake Okeechobee WRAC Meeting LOPP Update 08/10
- WRAC Meeting Draft LOPP 10/10
- Draft LOPP Public Release 10/10
- GB Meeting Draft LOPP 10/10
- End Public Comment Review Period 11/10
- L.O. WRAC/ WRAC/GB Meetings Final LOPP 12/10
- Final LOPP to the Legislature 3/11



Dispersed Water Management Projects

Northern Everglades Interagency Meeting

July 23, 2010

Benita Whalen, P.E. and Jesse Markle, P.E.



Dispersed Water Management Projects Past and Current Activities

- Since October 2005, 127,123 ac-ft on private, public and tribal lands
- Landowners have participated under three types of approaches
 - Easements
 - WRP/WREP (USDA NRCS)
 - Completed: 4,751 ac-ft
 - Design/Construction: 1,305 ac-ft; Note: does not include FEC 26,000-ac Special Project in Fisheating Creek Basin

Dispersed Water Management Projects Past and Current Activities, Cont'd

- Cost-Share
 - EQIP/BMP Implementation (USDA NRCS/FDACS)
 - Completed: 1,225 ac-ft
 - Design/Construction: 2,333 ac-ft
 - AWS/D & AWS (SFWMD)
 - Completed: 26,050 ac-ft
 - Design/Construction: 16,732 ac-ft
- Payment for Services
 - FRESP (Ranchers, SFWMD, FDACS, FDEP, USDA NRCS, UF IFAS, FCA, Archbold Biological Station, WWF)

Dispersed Water Management Projects Past and Current Activities, Cont'd

Annual Average Estimate of FRESP WMA Acres, Water & P Retention

	WMA Inundated Acres	WMA Service Area (Acres)	Estimate of Incremental Retention Post WMA (Ac Ft)	Annual Estimated P Reductions Post WMA (Lbs P)	Annual Estimated P Reductions Post WMA (MT P)
Rafter T Ranch	942	1,624	850	795	
Lightsey XL Ranch	364	364	227	295	
Payne & Sons Ranch	367	367	164	295	
Syfrett Ranch	521	2197	939	878	
Williamson Ranch	241	659	303	139	
Alderman – Deloney Ranch	49	322	138	40	
Buck Island Ranch	3,748	3,748	2,411	3,434	
Total Across Water Retention WMAs	6,232	9,281	5,032	5,876	2.7
Lykes West Waterhole Pasture	2,500	2,500	NA	7,220	
Total Across P Reduction WMA	2,500	2,500	5,600	7,220	3.3
Total All WMAs	8,732	11,781	10,632	13,096	6

Dispersed Water Management Projects Strategies Moving Forward

- Payment for Environmental Services Model Program
 - Solicitation
 - Service Payment Approach
 - "Above And Beyond" Baseline
 - Wetland Expansion
 - T/E Consultation Key
 - Standard Technical Assessment
 - Separate pilot project for more intensive agriculture



FDEP Agricultural & Non-Agricultural Programs

July 23, 2010

Frank Nearhoof, Science Coordinator

Katie Hallas, Northern Everglades Coordinator/Everglades Technical Specialist











FDEP Agricultural Programs

FDEP Dairy
 Rule/Concentrated Animal
 Feeding Operations (CAFOs)
 (http://www.dep.state.fl.us/water/wastewater/iw/afo.htm)



Example of CAFO facility

Biosolids/Domestic
 Wastewater Residuals Rule
 (http://www.dep.state.fl.us/water/wastewater/dom/resmake.htm)



Biosolid spreading













FDEP Dairy Rule/CAFOs

- 1987 FDEP Dairy Rule [phosphorus (P)] adopted
- 1989 FDEP Dairy Buy-Out Program created
- 2003
 U.S. EPA (EPA) National Pollutant Discharge Elimination
 System (NPDES) Permit Regulation & Effluent Limitation
 Guidelines & Standards for CAFOs [P and nitrogen (N)] adopted
- 2004 First EPA-mandated CAFO permit issued by FDEP
- 2008 Revised NPDES Permit Regulation & Effluent Limitation Guidelines & Standards for CAFOs adopted in response to Waterkeeper Alliance et al. v. EPA case













FDEP Dairy Rule/CAFOs

- FDEP's Feedlot & Dairy Wastewater Treatment & Management Requirements [Chapter 62-670, Florida Administrative Code (F.A.C.)] defines Animal Feeding Operations (AFOs) & CAFOs
- CAFOs = facilities where large numbers of poultry, swine, cattle, or other livestock are confined w/in smaller areas than traditional pasture operations
- Under Chapter 62-670, FDEP currently regulates 23 facilities in Lake Okeechobee Watershed (LOW)
 - 22 large CAFOs (over 699 milk cows on average)
 - 1 medium AFO (600 milk cows on average)













Biosolids/Domestic Wastewater Residuals Rule

- FDEP made amendments to Chapter 62-640, F.A.C.
- Environmental Regulation Commission (ERC) approved on May 20, 2010
- Effective rule expected end of August 2010
- Propose rule includes:
 - Changes to site permitting
 - Prohibition on land application in LOW unless nutrient balance demonstration completed by permittee as required under NEEPP
 - Nutrient Management Plans (NMPs) rather than former, more basic Agricultural Use Plans (AUPs)
 - Additional requirements for distribution & marketing of biosolids distributed as "fertilizer"













FDEP Non-Agricultural Programs

- National Pollution Discharge Elimination System (NPDES) Program
- Submerged Lands & Environmental (SLER) Program
- Other Permitting Programs
 - Comprehensive Everglades Restoration Plan Regulatory Act (CERPRA)
 - Northern Everglades and Estuaries Protection Plan (NEEPP)
- Statewide Stormwater Treatment Rule
- Comprehensive Planning / Land Development Regulations
- Educational Outreach













NPDES Program

- Stormwater
 (http://www.dep.state.fl.us/water/stormwater/npdes/index.htm)
 - Construction activity
 - Industrial activity
 - Municipal separate storm sewer systems (MS4s)
- Wastewater
 (http://www.dep.state.fl.us/water/wastewater/index.htm)



MS4 outfall



Chemical plant













NPDES Program-Stormwater-Construction Activities

 Regulated construction site "operators" must obtain an NPDES stormwater permit & implement appropriate pollution prevention techniques to minimize erosion & sedimentation & properly manage stormwater



Aerial photo of large construction site

- FDEP adopted Generic Permit for Stormwater Discharge from Large & Small Construction Activities (CGP)
- Each year, FDEP issues many CGPs throughout Florida













NPDES Program-Stormwater-Industrial Activities

- Florida adopted federal stormwater generic permit for industrial activities
- FDEP operates permit as state of Florida Multi-Sector Generic Permit for Stormwater Discharge Associated w/Industrial Activity (MSGP)

Permitted Facilities in Various LOW Counties

County	Number of Facilities
Glades	5
Hendry	12
Highlands	14
Okeechobee	9
Osceola	12













NPDES Program-Stormwater-MS4s

- Federal NPDES Stormwater Permitting Program
 - EPA developed in two phases
 - Phase I
 - Promulgated in 1990
 - Addresses "large" & "medium" MS4s located in incorporated places & counties w/populations of 100,000 or more & 11 categories of industrial activity, one of which is large construction activity that disturbs five or more acres of land
 - Facilities in LOW
 - 2 Phase I Permits in Orange County
 - 1 Phase I Permit in Palm Beach County
 - 1 Phase I Permit in Polk County
 - Phase II
 - Promulgated in 1999
 - Addresses additional sources, including MS4s not regulated under Phase I & small construction that disturbs b/t 1-5 acres of land
 - As of March 2010, NPDES Stormwater Section in process of permitting Glades County, Hendry County, Okeechobee County, & City of Clewiston













NPDES Program-Wastewater Facilities

- 1995-FDEP received authorization from EPA to administer NPDES Program in Florida
- Facility types:
 - 1. Domestic (municipal) wastewater
 - 2. Industrial wastewater



Domestic wastewater treatment facility



Industrial wastewater photos













Active NPDES Permits Issued by FDEP in Several LOW Counties

County	Facility Type							
	Car Wash	Concrete- Batch Plant	Domestic Wastewater	Industrial Wastewater	Mining	Petroleum Cleanup /Dewatering Sites		
Martin			35	5		1		
Glades		6		1				
Okeechobee		2	18	2		1		
Palm Beach	1	22	14	10	1			
St. Lucie	6	30	12					













SLER Program

- For more information, please see:
 http://www.dep.state.fl.us/water/wetlands/dist_contacts.htm
- Regulates activities involving alteration of surface-water flows, including new activities in uplands that generate stormwater runoff from upland construction & dredging & filling in wetlands & other surface waters
- Program ensures that new activities or modifications of existing facilities do not degrade water quality, compromise flood control, protection, or harm wetland systems
- Environmental Resource Permit (ERP) applications w/in LOW are processed by either FDEP or SFWMD in accordance w/division of responsibilities
- Since LOPA's passage in 2000, FDEP has issued:
 - 22 ERP permits Herbert Hoover Dike Rehabilitation & Repair, Kissimmee River Restoration
 - 4 modifications
 - 19 exemptions Beatty Ranch, Avon Park/Arbuckle Dike Restoration, Big Grassy, Lemkin Creek Wetland Restoration













Other Permitting Programs-CERPRA

- For more information, please see:
 http://www.dep.state.fl.us/water/wqssp/everglades/cerp.htm
- In 2000, Congress authorized Comprehensive Everglades Restoration Plan (CERP) to restore, preserve, & protect south Florida ecosystem, while providing for other water-related needs of region
- FDEP has permitting authority for CERP projects pursuant to CERPRA, Chapter 373.1502, F.S.
- CERPRA regulates construction, operation, & maintenance of project components as defined in 373.1501, F.S.
- Since LOPA's passage in 2000, FDEP has issued 2 CERPRA permits
 - 1. Lake O Aquifer Storage & Recovery (ASR)-Kissimmee to USACE
 - 2. Lake O ASR-Mayaca to USACE













Other Permitting Programs-NEEPP

- Under NEEPP, FDEP has regulatory authority to issue Lake Okeechobee Protection Permits (LOPP permits)
- LOPP permits are issued for Lake Okeechobee Watershed Construction Project (LOWCP) facilities & structures discharging into or from Lake Okeechobee
- For more information, please see:
 http://www.dep.state.fl.us/water/wqssp/everglades/neepp.htm















Other Permitting Programs-NEEPP

	Permitting Action						
Project	Permit	Major Permit Modification	Exemption	Non-Jurisdictional Exemption			
EBWCD/C-10 Pump Station	Χ						
EBWCD/C-12 Pump Station	X						
G-36 Structure Maintenance			X	X			
Lake Okeechobee Water Control Structure Operations	X						
Lakeside Ranch STA	Χ	X (pending)					
Lemkin Creek HWTT	Χ						
Nubbin Slough STA	XX	Χ					
SFCD/P-5-N Pump Station	X						
SSDD/Bean City Pump Station	X						
Taylor Creek STA	XX						
Total	11	2	1	1			











Statewide Stormwater Treatment Rule (Ch. 62-347, F.A.C.)

- Currently under development (adoption no earlier than July 2011)
- Provides statewide regulatory criteria for stormwater treatment systems
- Technology-based rule w/the following components:
 - Performance standard or goal (minimum level of treatment for nutrients)
 - Design criteria for best management practices (BMPs) used to treat stormwater that will achieve performance standard
 - Rebuttable presumption that a stormwater treatment system designed in compliance w/the design criteria w/in this rule will not cause or contribute to violations of applicable water quality standards. For the purposes of this rule, total phosphorus (TP) and total nitrogen (TN) will serve as a surrogate pollutant.
 - Periodic review & updating of BMP design criteria as needed to increase effectiveness in removing pollutants
- For more information, please see: <u>http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater/index.htm</u>













Comprehensive Planning/Land Development Regulations

- Florida Department of Community Affairs (FDCA) = primary state agency involved w/local government comprehensive planning
- FDEP's Office of Intergovernmental Programs (OIP) & SFWMD's
 Department of Intergovernmental Programs coordinate each agency's
 involvement in statewide planning activities
- In 2009, FDEP (in collaboration w/SFWMD) finalized "Nutrient Loading Considerations for Planning Decisions in NEEPP Watersheds" White Paper













Educational Outreach

- Florida-Friendly Landscaping (FFL) Program
 - Florida Yards & Neighborhoods (FYN) Program
 - Florida-Friendly BMPs for Protection of Water Resources by Green Industries (GI-BMPs)
- FYN Program
 - Partnership w/UF/IFAS, Florida's Water Management Districts (WMDs), FDEP, National Estuary Program (NEP), Florida Sea Grant College Program, concerned citizens, & other nongovernmental agencies
 - Addresses pollution in stormwater runoff, water shortages, & disappearing habitats













FDOH Source Control Programs

- 373.4595(3)(c)(7), F.S. → FDOH must require all entities disposing of septage within LOW to develop & submit to FDOH an AUP that limits applications based upon P loading
- NEEPP also mandated that by July 1, 2005 P concentrations originating from these application sites shall not exceed limits established in SFWMD's Works of the District (WOD) Program
- As of April 2010, only one remaining FDOH-regulated application site in LOW













Questions?

Frank Nearhoof
Science Coordinator
Division of Environmental Assessment & Restoration
Frank.Nearhoof@dep.state.fl.us
850.245.8420



David Unsell

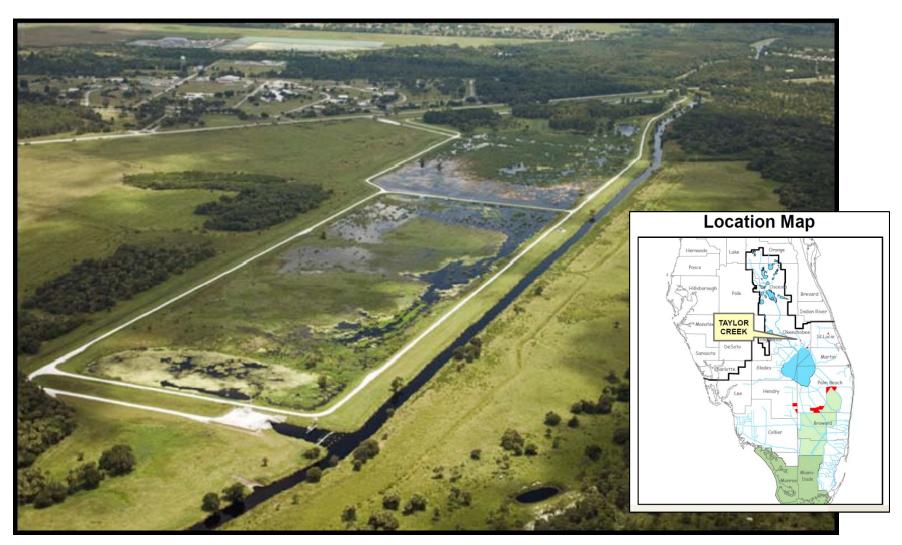
Director, Lake Okeechobee Division Restoration Sciences Department

Northern Everglades Interagency Meeting
July 23, 2010

Northern STAs and Lemkin Creek Stormwater Project

North West Lake Okeechobee

Taylor Creek STA



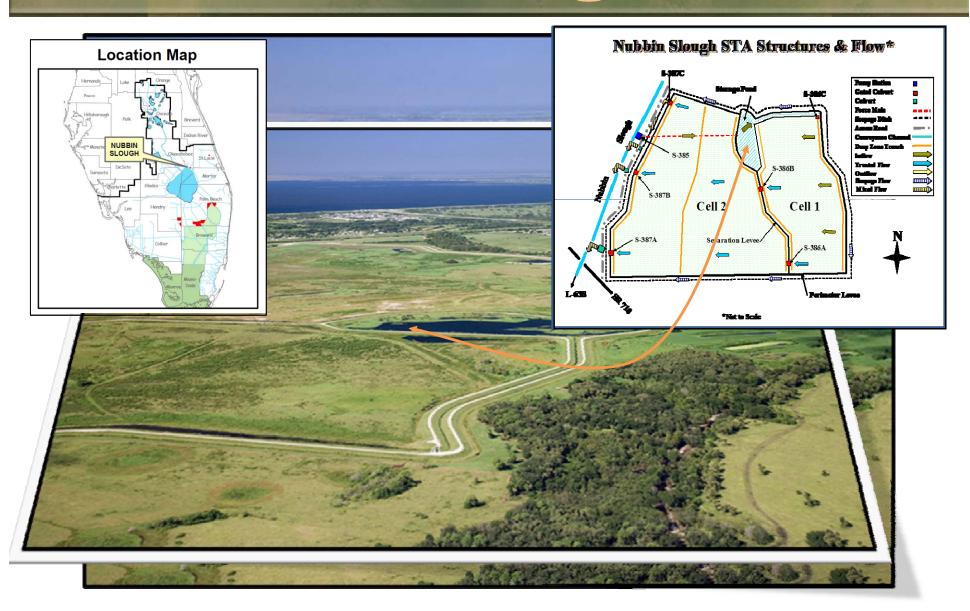
The Taylor Creek STA. Photo by the SFWMD

Taylor Creek STA

- 142 Treatment Acres
- Flow through operations began June 26, 2008
- Operations stopped on February 24, 2009
- 1.3 MT of P removed
- TP removal efficiency of 32%
- Restart anticipated for August, 2010



Nubbin Slough STA



Nubbin Slough STA

- 773 Treatment Acres
- Numerous issues w/pumps
- Anticipate August2010 start up
- Predicted 5 mt/yrP removal
- Exploring additional water sources



Lakeside Ranch STA



Lakeside Ranch STA

- Phase I
 - 925 treatment acres
 - 10 mt/year phosphorus removal
 - \$31M total cost
 - Constructed by February 2012
 - Lakeside Ranch STA

- Phase II
 - 1050 treatment acres
 - 9 mt/year phosphorus removal
 - \$42M total cost, includes
 \$-191A pump station



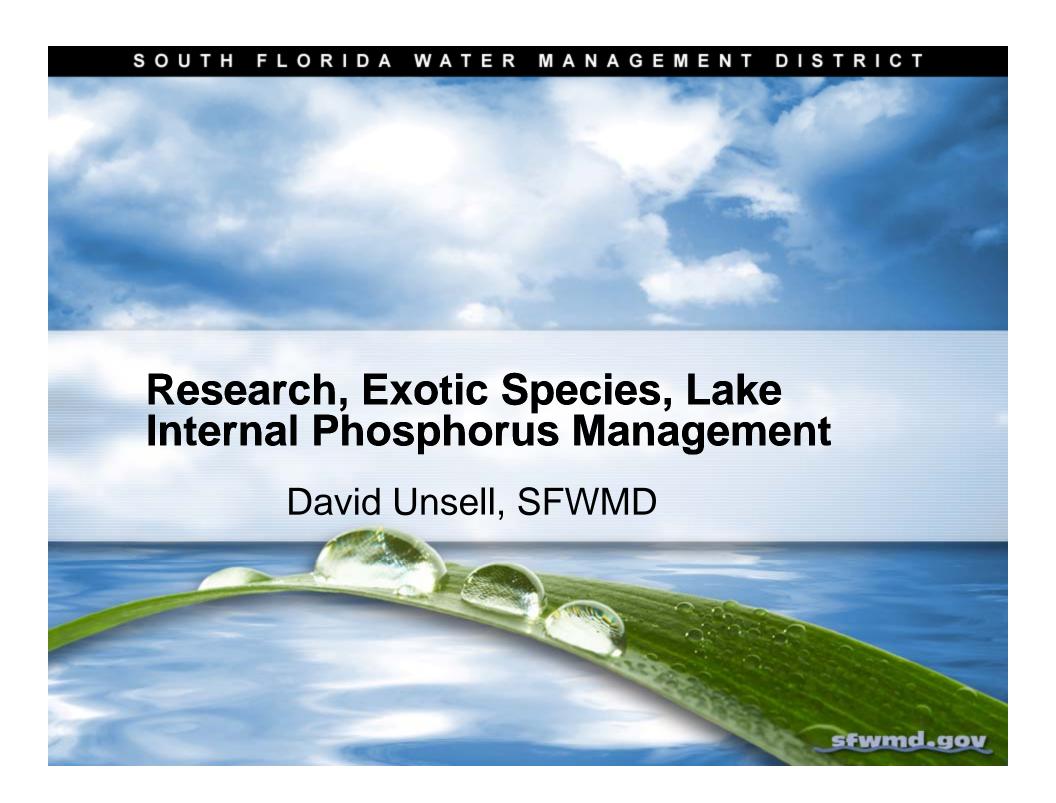
Lemkin Creek Stormwater Project



Lemkin Creek Stormwater Project

		Estimated Costs				
	Stormwater Quantity	Water Quality	Ecological	Recreational	Construction (with 30% contingency)	O & M Range
Alternative 1	Slight improvement in 7th Avenue Area (0.25- 1.05 foot peak stage reduction); No notable differences between alternatives	Phosphorus removal range of approximately 6-28 kg/yr	No Notable Benefits	No Notable Benefits	3.70Mil	19K- 222K
Alternative 2	Slight improvement in 7th Avenue Area (0.25- 1.06 foot peak stage reduction); No notable differences between alternatives	Phosphorus removal range of approximately 6-28 kg/yr	No Notable Benefits	No Notable Benefits	4.37Mil	19K- 262K
Alternative 3	Slight improvement in 7th Avenue Area (0.25- 1.07 foot peak stage reduction); No notable differences between alternatives	Phosphorus removal range of approximately 302-333 kg/yr	Creation of approximately 80 acres of aquatic wetland habitat	Potential for bird watching, education and hiking	4.40Mil	16K- 320K

Questions? **Northern STAs and** Lemkin Creek Stormwater Project **David Unsell Director, Lake Okeechobee Division Restoration Sciences Department**



Research Projects

- Taylor Creek Algal Turf Scrubber
- ■Mike SHE/Mike 11 model, S-191 Basin
- Nutrient Budget for Lake Okeechobee Watershed
- Continued development of WAM and Documentation
- Northern Everglades Chemical Treatment, Phase I&II
- HWTT
- Safe Soil Phosphorus Storage Capacity
- Permeable Reactive Barrier Technology
- Ranchland BMP Research
- Water Table Management and Phosphorus Release
- Ranchland BMP Phosphorus Retention
- Long Term Water Quality Trends



Research Projects

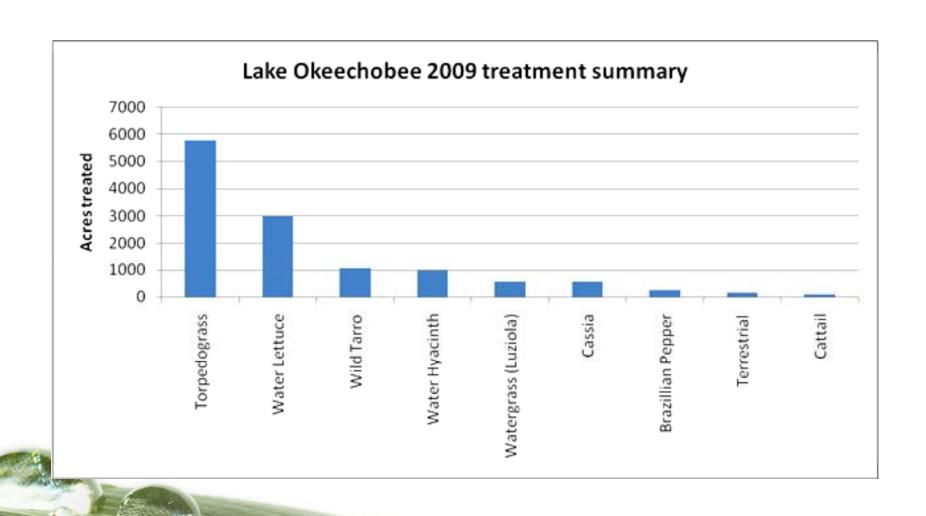
- Pasture Water Management and Phosphorus Control
- Composted Animal Waste in Potting Material
- Nutrient Needs for Sod Production
- Legacy P Study



Exotic Species Management



Exotic Species Management



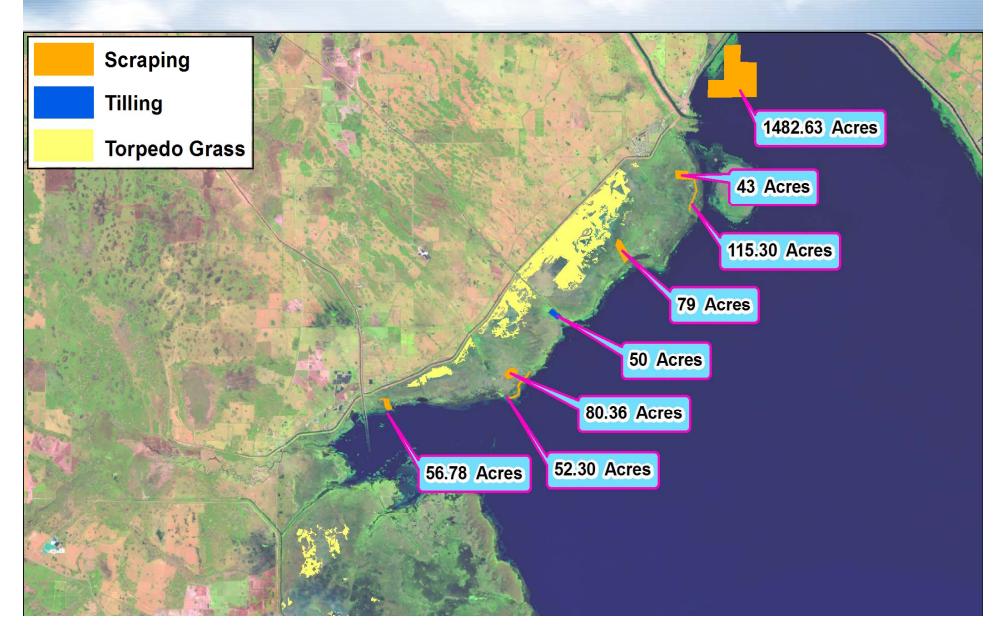
Eagle Bay Dredging

- 900-3000 acres, stage dependent
- \$25M-\$35M Cost, not including land
- \$15-\$20/cubic yard removed
- Benefit longevity not assured





Low Stage Scraping and Tilling



Low Stage Scraping and Tilling

- Scraping
 - ■2007 2M cubic yards, \$11M
 - ■2008 348K cubic yards, \$1.4M
- **-**Tilling 2008
 - 40 acres near Indian Prairie
 - P sequestered
 - Sand surface eposed



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Questions



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

2011 Lake Okeechobee Protection Plan (LOPP) Update P Source Control Programs

Section 5.1 Overview - SFWMD Programs and Projects

By Agnes S. Ramsey, Lead Technical Program Specialist, Environmental Resource Regulation Department







Section 5.1 Overview



Purpose

- Development of Source Controls in Lake Okeechobee Watershed (LOW)
- Source Controls Defined
- Status Updates
 - LOW Source Control Efforts by the SFWMD, FDEP & FDACS
 - Regulatory
 - Source Control Projects
 - FDACS Best Management Practices (BMPs) Program
 - FDEP Source Control Programs





Section 5.1 Purpose

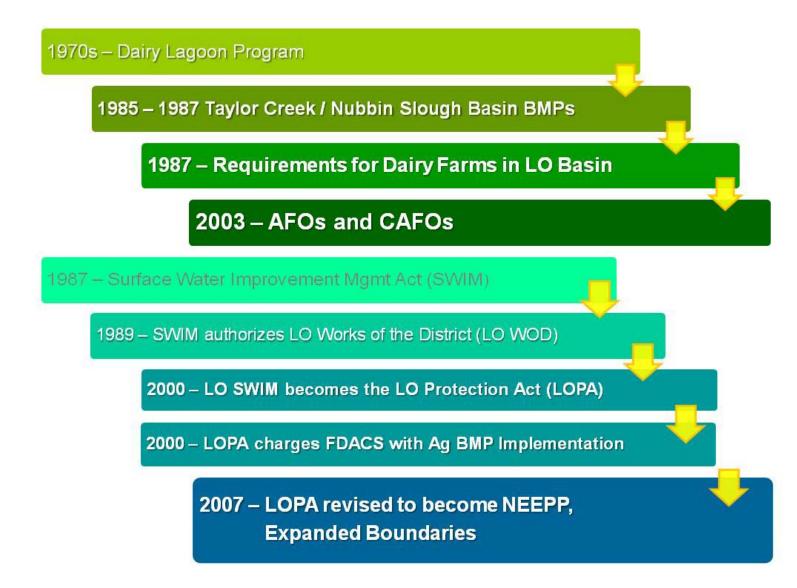
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



staving agenr

Development of Source Controls







Source Controls Defined



- Source controls are measures that prevent or reduce nutrient pollution at its source and are intended to:
 - Minimize the amount of nutrients used onsite
 - Ensure nutrients are applied effectively
 - Ensure that local runoff is retained onsite
- Source controls may be structural or nonstructural actions to minimize or eliminate nutrient impacts to receiving water body

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



Structural Source Control Measures



Urban Retention & Overflow



Managed Discharge Structure



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

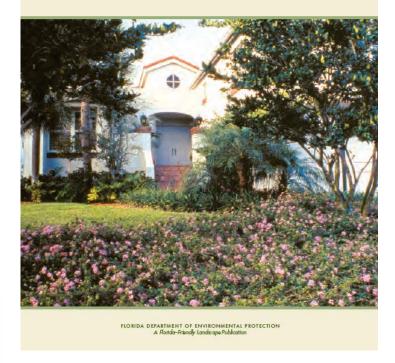


Non-Structural Source Control Measures

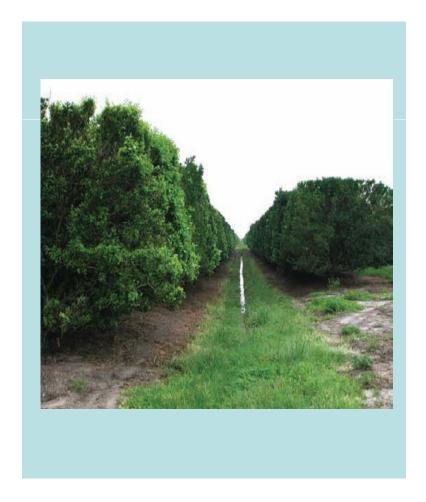


Florida Friendly Landscaping Guide

Florida Friendly
Best Management Practices
for Protection of Water Resources
by the Green Industries



Vegetated Furrows







Section 5.1 Regulatory Status Update



LOW Regulatory P Source Control



- Focus is to establish:
 - BMP based Phosphorus Source Control Program
 - Ag lands participating in the FDACS BMP Program meet the intent of the LOW P SCP rule
 - Timeline for implementation
 - Load-based performance measures for the combined SCPs
 - Monitoring network
 - A plan for improvements should the WQ criteria not be met
 - Consistency with data in the LOPP
 - Incentives for participation in demonstration projects



LOW Regulatory Phosphorus Source Control Program



Status:

- Consulted with Urban Stakeholders on Areaspecific issues
- Held Rulemaking Workshops
- Completed technical evaluation of the LOW Assessment (LOWA) monitoring network for the Taylor Creek / Nubbin Sough sub-watershed
- Continued to develop and evaluate alternatives for performance measure methodology
- The goal is to adopt Rule (Chapter 40E-61) adoption amendments in 2011



Northern Everglades ERP Program Rulemaking / Guideline Revisions



Northern Everglades ERP Program:

- Primary objective: ensure that alterations in stormwater runoff do not impact surface waters, compromise flood protection, or adversely affect the function of wetland systems
- Requires treatment of stormwater to a specified level of pollutant load reduction for all new development
- Regulates both agricultural and non-agricultural activities that alter surface water flows
- Includes land development projects that influence stormwater runoff in upland areas
- Includes dredging and filling activities in wetlands and surface waters



Northern Everglades ERP Program Rulemaking / Guideline Revisions (Cont.)



Status:

- NE ERP rule was revised to address quantity (hydrology) instead of quality (covered in the Statewide Stormwater Rule under development)
- The SFWMD is in the process of developing the Northern Everglades Environmental Resource Permit Basin Guidelines
- Developing a technical memo to share with stakeholders by the end of 2010
- The goal is to begin implementation of these Basin Guidelines within the LOW in 2011



Section 5.1 Source Control Projects Status Update



Hybrid Wetland Treatment Technology



 Description: Chemical coagulants are added, either continuously or intermittently, to the front end of wetland treatment system, which contains one or more deep-water zones to capture resulting floc material







Status:

HWTT Average Inflow and Outflow TP and TN concentrations March 2008 through May 2009 Continuous-flow Systems

HWTT Site Location	Sampling Station	TP (µg/L)	TN (mg/L)
Nubbin Slough	Inflow	863	1.27
	Outflow	109	0.9
Mosquito Creek	Inflow	548	3.08
	Outflow	27	1.5
Ideal Grove	Inflow	273	1.18
	Outflow	27	0.68

These systems show promising results with total P concentration reductions ranging between 87 and 95%.



Algal Turf Scrubber™



 Description: Scaled-up demonstration of a proprietary water treatment technology that employs algae to remove pollutants from impaired waters

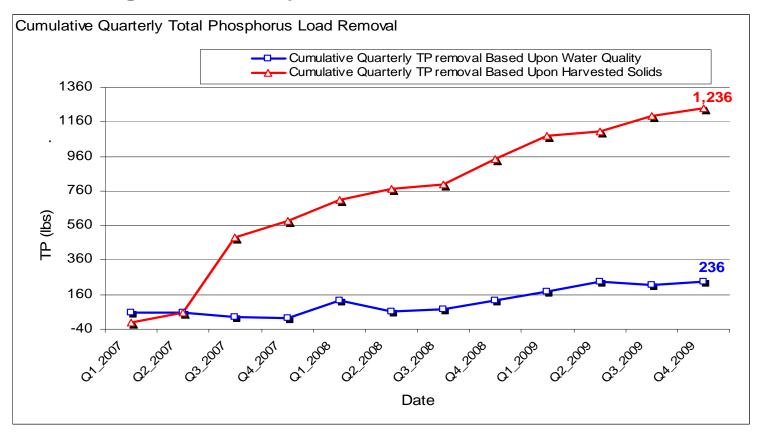




Algal Turf Scrubber™ (Cont.)



Status: Project conducted January 2007 through January 2010 - complete



^{*}Poor system performance was attributed to algal toxicity in the source water.



Chemical Treatment



- Phase I: Completed July 2009 and was conducted to:
 - Investigate available information on chemical treatment technologies that have been tested within other water bodies to reduce TP loads in stormwater runoff
 - Identify technologies for use in the LOW
- Results:
 - Various chemical treatment technologies are viable and represent effective options for reducing P loads
- Phase II: the District is evaluating implementation costs and sites to be completed in September 2010



Dairy Best Available Technologies (DBĂTS)



Purpose: Edge-of-farm treatment of stormwater runoff by Retention/Detention (R/D) ponds and chemical treatment to reduce the export of P from dairy operations





Dairy Best Available Technologies (DBATS) (Cont.)



Results:

- Annual TP Reductions for Water Retention and Reuse ranged from 0.19 to 1.62 mt or 66 to 100% at three of four Study Farms
- The low P removal at Davie Dairy was due to high dependency on chemical treatment for removing P, which unfortunately only functioned approx 20% of the time

Project Site	Annual P Load from Surface Runoff (lb)	Average Annual Reduction (lb) / (mt)	Annual Reduction Due to Retention (lb)	Annual Reduction Due to Treatment (Ib)	Overall Efficiency (%)
Butler Oaks	4,449	3,555 / 1.62	2,965	586	80
Dry Lake	4,212	2,787 / 1.27	2,511	275	66
Davie Dairy	4,594	412 / 0.19	3	409	9
Milking R	3,527	3,527 / 1.60	3,527		100



Wetland BMPs Research and Restoration Projects



Determine:

- Effectiveness of isolated wetlands in dairy and cow/calf operations on phosphorus assimilation and storage
- Effect of hydrological restoration on water storage and flow paths
- Change (if any) in phosphorus storage as a result of restoring hydrology
- Composition and stability of soil organic phosphorus in the Okeechobee Drainage Basin

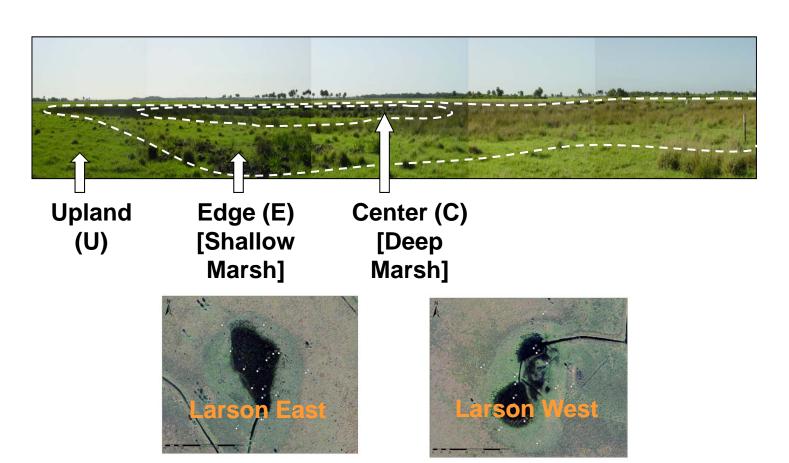
Validate:

 Hydrologic and P models for adaptation to the Lake Okeechobee Basin and use these models to simulate P retention capacity





Isolated Wetlands - LOW





Cow / Calf BMP Optimization



Objectives:

- Document the effects of water storage and reduced flow on the quality of water leaving the pastures
- Evaluate forage yield and quality, and animal performance as influenced by water retention
- Determine nutrient load reductions from the pastures by integrating flow, vegetation, water quality and animal performance data

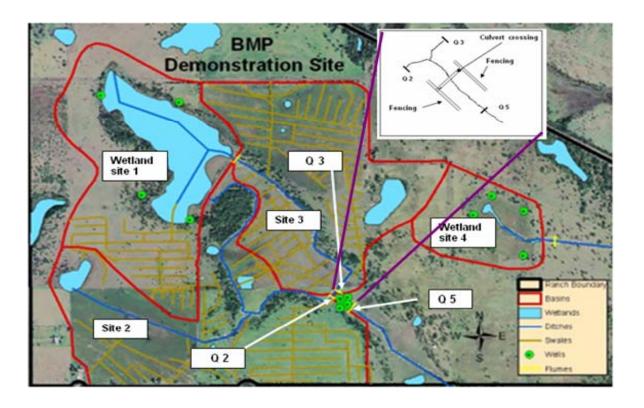


Water Quality BMPs for Beef Cattle Ranching



Goal:

- Demonstrate effectiveness of cow-calf BMPs most promising in the LOW
- Evaluate the resulting change in nutrient loads





Former Dairy Remediation Projects



Description:







Former Dairy Remediation Projects



Results:

Project Site	P Inactivated in Waste Pond Water (Ibs)	P Inactivated in Waste Pond Solids (Ibs)	Annual P Load from Surface Runoff (lbs)	Annual P Reduction Due to Water Retention (lb)	P Reduction due to Water Retention (%)
Mattson			1,269*	805	63.5
McArthur 5		14,076	2,307**	2,307	100.00
Candler	204	447	250~	250	100.00
Lamb Island	299	17,010	5,165	5,142	99.5

QUESTIONS





sewmd gov